

THE CONDITION AND TENDENCIES  
OF  
Technical Education in Germany

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## INTRODUCTION

The question of the technical phases of education is, with any nation, a vital one. Perhaps this is true of Germany as it is of no other European country. This may be mainly due to one of several causes. First, as to the length of time technical education has had a place in the German schools. In some form or another, and in a greater or lesser degree, such instruction has been in vogue for many years, and has in no small measure become part and parcel of the educational fabric of the nation. Again, throughout the various German States, the work is rather widely differentiated, this owing in part to the fact that the varying lines of industry in adjacent localities even, give color and bent to the technical education of any particular locality. An extensive field is thus comprehended under the term "technical education". Then, too,

Germany as a nation must needs better her condition in order that she may prove self-sustaining. The country is not a wealthy one, and if in trade, in manufacture, and in commerce, she is to compete, and that successfully, with the world powers, strength must be gained along such lines as those opening through technical education.

The hope is entertained that the following pages may prove of value, not alone to the student of technical education as it exists in Germany, but particularly to those who are endeavoring to institute and develop industrial and technical training in this country. The possibility along these lines is exceedingly great and the interest and attention of thinking people is focused here. They look to this form of education as a partial solution of some of the most obstinate problems now confronting us.

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## PUBLISHER'S NOTE

This book was published under some disadvantages, as it was delayed by the removal of our office to a larger place of business, and by a printers' strike, which resulted in four changes in foremen. This, together with the fact that the author was upon the Pacific coast and proof was delayed and sometimes lost has led to errors for which he is not responsible. Besides typographical blunders easily recognized the following are noted:

Page 13, next line to last for *Air* read *Art*.

19, 5th line, for *enable* read *ennoble*.

23, 4th line from below, for *committee* read *communities*.

25, 5th line, for *development* read *department*.

63, 7th line, for *models* read *modes*.

72, next to last line, the 1 should be in *second* half of first year, making the totals 41 and 43 instead of 42 and 42.

79, in table, Knitting should have *1 yr.* instead of *2 yrs*, and the line beginning *Machinery* is to be omitted.

81, 4th line from below, insert *to* before *enter*.

93, last part of paragraph, read "The one course plan however has been substituted for the several."

# Technical Education in Germany

BY PROF. ARTHUR HENRY CHAMBERLAIN

## I

If one were to point out the most distinctive feature of the educational system in the Fatherland to-day, it would perhaps be the highly specialized condition of the technical schools.

In approaching our problem we naturally ask ourselves the question as to how far the industrial progress of a country is influenced by technical education. In no time as in our own has so much stress been laid upon the commercial side of our existence. New trades, new industries are springing up ; specialization is becoming more far-reaching and more firmly established than ever be-

fore; competition is becoming keener; the application of science to the arts is more varied.

In this latter field we find Germany in the very fore front, she having developed along these lines to a greater extent than have many of our nations. Illustrations of this application lie all about us,—in the bettered transportation facilities by railroad and by ocean vessel; in the more improved bridge and building construction; in the methods of water supply and drainage; in modes of heat, light, and ventilation; in electric vehicles, sound transmitters, labor-saving machinery; in finely adjusted instruments that bring far away worlds almost within reaching distance; in these and a thousand other ways is made manifest the result of the application of science to the arts. Germany is taking a prominent part in this warfare for industrial supremacy, and that she expects her technical schools to be



largely instrumental in answering many of the problems of the present and the future cannot be doubted, especially when one is made aware of the diversity and extent of the schools of a technical character scattered over the Empire.

It will be readily understood from the foregoing how difficult a matter it is to make any one classification that will cover in an adequate manner the various types of existing institutions. Frequently a school is found which in some respects is distinctive. To place such a school in this or that category would of course do violence to the classification, while to form a new class only serves to further complicate and bewilder. Again, various of the institutions mentioned may offer such a differentiated schedule or be made up of so many parallel departments as to entitle them to admission into two or more of the classes given.

Another point of difficulty lies in the fact

that the term "technical" would in Germany be somewhat more sweeping than with us in America. We do not class technical training with so-called manual training or handwork of the elementary schools. In our present study however, we shall find that while in the main we are dealing with the technical training of boys from fourteen to eighteen years of age,—comparable in a measure to our high or secondary school courses, we shall also include the industrial, vocational, or trade training of men and boys alike, as well as work in the more simplified forms of handicraft, as carried on in the lower or elementary school. Reference will also be made to the instruction of a higher order,—such for example as makes for engineers. These facts will be illuminated as the study proceeds.

In reading into these schools their real significance, several points must be kept constantly in mind. At an early age the

German youth is supposed to have solved the problem of his likes and dislikes, his abilities and shortcomings; to have gained such a perspective of his probable chances for future success, as to choose the line of work or occupation he shall follow. It is only fair to state, however, that circumstances have much to do with such decision, viz,—the occupation of the father, the financial outlook of the family, the industrial demands of the locality, the particular educational opportunities offered,—these and like problems entering in as vital elements.

Then too, the founding and sustaining of a technical school is a matter to be noted. This may be in the hands of the general government, of the state, of the municipality, or may be looked after by private enterprise. The Guilds, Vereins or Associations may organize, equip and foster schools of such character as train directly for their particular lines of work. It must be stated

however in this connection, that there seems to be a strong tendency at the present time toward the centralizing of control in the states. This has been brought about in large measure through the ever-increasing willingness on the part of the state to give financial backing to the schools, and thus has quite naturally arisen the desire and necessity on the part of the state, that it have a controlling voice in the school administration. Herein lies one of the main differences between such education in Germany and that of our own country.

Conrad's Handwörterbuch der Staatswissenschaften, 1900, in an article entitled "Gewerblicher Unterricht", gives the following table on state expenditure for trade and technical instruction in recent years:

Prussia:

Marks 142,000 (\$33,796) in 1874;

Marks 475,000 (\$114,050) in 1885;

Marks 4,672,000 (\$1,111,936) in 1899.

Saxony:

Marks 235,000 (\$60,214) in 1873

Marks 570,000 (\$135,660) in 1885;

Marks 1,138,000 (\$270,844) in 1898

Wurtemberg industrial continuation school:

Marks, 58,000 (\$13,804) in 1869;

Marks 129,000 (30,702) in 1879

Marks 164,000 (\$39,032) in 1889;

Marks 208,000 (\$49,504) in 1897.

The cost of the state per capita of the population of the expenditures was as follows:

Prussia, Pfennigs 15 ( $3\frac{1}{2}$  cts.) in 1899;

Saxony, Pfennigs 29 (7 cts.) in 1898;

Hesse, Pfennigs 22 (5 cts.) in 1898.

The cost per Marks 1,000 (\$236) of the entire state expenditures was Marks 2.27 (54 cts.) in Prussia in 1899, and Marks 5.88 (\$1.40) in Saxony in 1898.

In general the German schools are classified upon a basis of the grade of instruction given rather than upon the character

of the subjects taught. Primary education is compulsory, that is to say, all children are compelled by law to attend school from their sixth to their fourteenth year. It is at this point that we find our difficulty. To quote Dr. Alwin Pabst of Leipzig (who speaks of conditions governing technical schools):

“The age of admission, length of course, fees and other conditions (examinations) or these schools differ widely. Ages ranges from fourteen to thirty years or over; length of course, one to four or five years; fees perhaps twenty to thirty marks per year. The Fortbildungsschule is the only institution in which no fee is charged.” (Taken from a personal letter.)

Several classifications commend themselves for use. Each has its weaknesses and breaks down at some point, owing to the conditions previously mentioned. In order

the better to illustrate this difficulty I shall give these various possible classifications.

The first refers chiefly to the scheme of secondary education and was the one first chosen and later discarded. It was suggested mainly by Sir Philip Magnus's work on "Industrial Education" and the "Report of the Industrial Commission", Vol. I.

1. Industrieschulen  
Gewerbeschulen
2. Trade Schools  
Fachschulen
3. Building Trade Schools
4. Secondary Technical Schools  
Higher Technical  
Foremen  
Building  
Weaving  
Drawing
5. Industrial Art Schools (Kunstgewerbe)  
Pure Art  
Applied Art

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6. Polytechnics or Technische Hochschulen

7. Continuation Schools—Fortbildungsschulen

Another classification, suggested in most part by a German authority is as follows:

1. Fortbildungsschulen — Continuation schools

2. Industrie—or Fachschulen — Special Trade Schools

3. Gewerbeschulen

4. Technischeschulen

5. Technische Hochschulen

6. Baugewerkschulen—School for Architects

7. Kunstgewerbeschulen—Schools of Art

In the Seventeenth Annual Report of the U. S. Commissioner of Labor for 1902 we find the following:

1. Technical Colleges

2. Secondary or Intermediate Technical Schools



3. Schools and Museums of Industrial Art

4. Schools for Foremen

5. Schools for the Textile Trades

6. Trade and Industrial Continuation Schools

7. Industrial Drawing Courses

8. Other Institutions for Industrial Education.

The order followed in the present study is finally given below. It is one not to be found elsewhere, but more closely resembles that of Dr. Pabst (the second classification) and that found in the Seventeenth Annual Report of the Commissioner of Labor. It has undoubtedly its weak points, but I feel it is the best that can be made however, as it is based upon data recently published, and the results of correspondence with German school authorities, in addition to a not very extended knowledge gained through personal contact with the German

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schools. It may be taken therefore, as bringing the work down to the present time:

1. Continuation Schools or Fortbildungsschulen

2. Trade Schools or Fachschulen

3. Secondary or Intermediate Technical Schools or Gewerbliche Mittelschulen

4. Technical Colleges or Technische Hochschulen

5. School and Museums of Industrial Art, or Kunstgewerbeschulen

## II

### CONTINUATION SCHOOLS

#### FORTBILDUNGSSCHULEN

Since at the age of fourteen years the German youth is no longer under the control of the compulsory school law, the value of the system of continuation schools is rea-

lized. Of necessity the great mass of boys are at this age, forced to enter some gainful pursuit. It was clearly evident to the German people that boys should not be cut off from school education at this early age. Dr. James H. Russell in his *German Higher Schools* says:

“The elementary and secondary schools are quite independent of each other—not one boy in ten thousand finds his way from the highest class of the elementary school into the Gymnasium.”

It is evident that year by year an increasingly large number of boys discontinue their education at the close of the elementary school, for a statement made by Mr. Michael N. Sadler, (Vol. III of *Special Reports on Educational Subjects*, London), some years prior to the above writing, would seem to indicate a lesser percentage of dropping out than that proposed by Dr. Russell.

The desire then for more extended educational advantages must have been early felt, and there sprang into existence what has since developed into one of the most significant features and far-reaching factors in the German scheme,—the continuation school. I quote from Mr. H. Bertram who writes of the continuation schools in Berlin, December, 1899:

“Amid the development of civilization among the nations the idea of the continuation school is making its way with increasing strength. Urgently required by the conditions of social organization, and in its turn acting on them, the new institution appears in many forms. It claims its place side by side with the Church and the School.

Among the great number of those who enter early upon the practical business of life, to whom the primary school has offered a start there awakens, sooner or later, the desire to

share in the stores of knowledge which human intelligence has won, in the insight into the working of the forces of nature, which it has acquired and applied to industry, in the arts which enable and support human action; in short to participate in the spiritual treasures which are, as it were, the birthright of those born under a luckler star. This desire, which opens to the diligent the way to material prosperity and inner contentment, seems for society as a whole an important incentive to industrial progress, and turns the discontent of the slaves of machinery into happiness of men conscious of their own success. The more the old order changes which held the work people in the narrow bonds of tradition, the more is customary prescription replaced by education and independent judgment, by insight into existing conditions, by special excellence within a particular sphere. For this reason, the elementary school, however

efficient and methodically correct its action may be, cannot suffice for the happiness of the masses, nor for the preservation of society. The instruction must come into close contact with the life of the future citizen, and must be at the command of everyone desirous to learn, as long as he seeks it. But the seeker, born amid such conditions as these, needs guidance. Public libraries, newspapers, magazines help him the more he pushes forward, but without expert assistance he hardly finds the beginning of the path.

“This is the object of the Continuation School.”

It is somewhat difficult to define the limits and scope of the continuation of Fortbildungsschulen. Conditions vary in the different German states and especially do they vary in the various kinds of continuation schools. Definition is made even more doubtful when we find that the limits

of certain schools overlap. It may be said that students are regularly admitted from fourteen to sixteen years of age. Not infrequently however, boys and men of more mature years take advantage of the courses offered. Instruction is carried on during the week-day evenings from six to eight o'clock and on Sunday mornings.

Prussia leads the other states in the number and character of her supplementary schools, the system having its fullest expression in Berlin. The fact became early apparent that preparation, whatever line the boy was to follow, was necessary, and this thought is confirmed in the many skilled laborers in Germany to-day. In Prussia, as elsewhere, it was found that boys many times left the common school before they became proficient in any line of book work. The causes were various; poverty, indifference, sickness, overcrowding, poor enforcement of the compulsory attend-

ance laws,—all these conspired to make supplementary schools necessary. In the older provinces very little attention was given the continuation school prior to 1875, and almost as much could be said of those provinces which were acquired in 1866. In 1844 a report issued by the Department of Public Instruction makes mention of the usefulness of such schools, while two years later a second report has only slightly more to say on the subject. This lack of interest may be attributed in large measure to the non-financial support of these schools by the government.

Several problems had to be faced in working out the scheme. Certain definite relations between the primary and continuation schools must be observed; those coming into the latter with an inadequate under-school knowledge must be looked after; provision must be made for students of lesser as well as of more mature years; all



classes of occupation must be given attention; these and many other difficult questions were to be met and overcome.

“Three principles,” says Mr. Bertram, “have contributed to the solution of this problem—free choices between the courses provided, free enjoyment of the preparatory courses without fee, and the selection of the teachers according to their attainments in a particular branch and their ability to adapt their instruction to the needs of the pupils or participants in the course.”

In certain sections, Nassau and Hanover for example, state aid came early to the continuation school. In 1874 an increased appropriation resulted in the betterment of the schools then existing and in the further establishment of like institutions. Here the committee must meet the cost of building, heating, lighting etc., and one-half of all the expenses not covered by the actual tuition. Since 1878 there is a fairly general

acceptance throughout the Empire of the statute providing that all employes under eighteen years of age must be allowed to attend a continuation school, the period of attendance to be determined by "competent authority". This naturally leads the Public Instruction Department to be free in its financial support.

It will be understood that in most cases six hours per week is the attendance required and that only those who have left the Volksschule or lower school and are not attending any higher institution are admitted. In Saxony a somewhat different condition exists. Children who have not made satisfactory progress in the Volksschule must, perforce, attend the continuation school for two years.

The writer of this paper was thoroughly impressed with the work of the Sunday classes as seen in Leipzig, Saxony, during the summer of 1899. His first introduc-

tion to such work was made, when on joining a group of boys, several of them carrying draughting-boards, he was conducted by them to their school. The general character and development of the boys, the spirit and enthusiasm manifested by them, and the thoughtful and intelligent quality of the work produced, fully justified in his own mind, the validity and worth of the Sunday class instruction.

As between the schools located in the cities and those in the smaller towns and country places, there is some slight difference. They may be classified as (*a*) rural or (*b*) city schools, on account of their location. The distinction lies rather in the arrangement of their curricula, the needs of the students in the particular locality being kept in mind. In the rural schools the programme of studies is somewhat general, comprising the German language, arithmetic, mensuration, nature study; and in some

instances may be added to these, geography, German history, drawing, gymnastics and music. This programme is elective to the extent that the capacity and previous education of the pupil are considered, and too, the ability of the teacher, local conditions and the time spent by the individual student. Such schools are admonished not to take on the character of technical institutions, but rather to continue the general education begun in the Volksschulen. Only under certain conditions is less than four hours per week of instruction permissible.

In Prussia the city continuation schools are of two grades, each grade made up of a number of classes. In the lower grade schools, instruction is given in accordance with the particular trade or calling the pupil is to follow. In the upper grade, work is much the same, proficiency being the chief additional feature. When six hours

of work is the minimum, language, arithmetic, elementary geometry and drawing, form the body of the course; while penmanship, geography, history, grammar and nature study all are taken up in connection with the reading work. Business forms are not overlooked. In the more fully equipped schools where the teachers are prepared for such branches, higher mathematics, mechanics, physics and advanced drawing are taken up.

If, as before stated, the various types of continuation schools overlap, the same is true regarding the trade and industrial continuation schools. While in many instances the work in the latter schools is of a general character, aiming to supplement or round out the education of the pupil, we find that many of the original schools of this class have developed into a form of special or trade school. This is brought about through pressure from without, as it were.

When a certain industry predominates in a locality supporting a continuation school, it is only fair to suppose that the work done, general though it may be, will be colored to some extent at least, by the demands of such industry. If this process of merging is carried sufficiently far, as is in many cases done, the school may lose almost or entirely its original trend, and from a Fortbildungsschule, fall into the class of trade or Fachschulen.

In the main then, the instruction given in a continuation school proper, is either of a theoretical nature or involves some form of drawing perhaps, thus rendering any other than an ordinary school room unnecessary for class use. In the city of Leipzig the situation is dissimilar to that in some north German cities. Here the classes are arranged according to the various trades followed, as bookbinders, printers, lithographers, bakers, metal work-

ers, workers in wood and stone, etc. There are again in Southern Germany simply schools of drawing with special reference to the various trades and industries. In addition to these are classes of a general nature for boys not following special trades. Such schools however, cannot be found in the smaller towns or in the country. Certain other Saxon cities have schools of somewhat similar character.

In the Consular Report, Vol. 54, No. 202, page 447, 1898, Mr. J. C. Monaghan says, writing under the title *Technical Education in Germany*:

“The supplementary schools are for the people who have to work, what Chautauquas, summer schools, and university extension courses are for others.—Parties in politico-economic circles have found that the system of common school education under which boys and girls were given an ordinary education in reading, writing, arithmetic etc.,

up to their fourteenth year, was inadequate, partially if not wholly, to the ends aimed at in such a system. To supply this defect it was urged, and finally proposed and favorably acted upon, that graduates of the common schools, boys especially, in some few cases girls too, should continue to get instruction a certain number of hours a week. This was made compulsory. Manufacturers, shopkeepers, and mechanics in whose employ such boys were found, and not the parents, were made responsible for the boys' attendance. In these schools, as indicated in the foregoing, the boys get as good an idea as possible of the trade or branch of business in which they are employed. As a rule, the hours of attendance are early in the morning or a certain number of afternoons in the week. Sunday mornings are not thought too sacred for such work. It seems to be an acknowledgement that the years hitherto given to a boy in which to



get an education, viz., from his sixth to his fourteenth year, are not enough to prepare him for the struggle for life that he has to enter upon. Men have told me, successful merchants and agents here, that they owe more to the hours spent in the developing or supplementary schools from the practical character of the instruction given and the information imparted, than to the many years spent in the common schools. While one is hardly willing to believe this, there can be no doubt of the good work done, and being done, by the schools referred to."

The Handwerkschulen in Berlin are very similar to Fortbildungsschulen in Leipsig for example. These schools have seen a marvelous developement during the past few years. "They have a technical quality, giving much attention to drawing. The sessions are in the evening, eight hours per week, the fee being six marks the half year.

They are attended by journeyman and apprentices who come recommended by their employers. In connection with these schools various Sunday classes are conducted throughout the city, each center specializing along certain trade lines.

The Berlin Handwerker Verein is a type of continuation school, sustained not by the state but by an association. The Verein, founded in 1859, has for its object the promotion of general culture, a partial knowledge at least of the several callings represented, and good manners (*gute sitten*). The moral and ethical elements are not lacking. Here public lectures of real merit are given, together with music, gymnastics, and instruction in general and technical subjects. Boys of good character, over seventeen years of age, are admitted. The families of the boys in attendance are also allowed to avail themselves of such general

exercises, lectures, music, etc., as the school offers.

What may also be styled as belonging in a sense in the continuation school category is the German Association for the Diffusion of Popular Education, with headquarters in Berlin. Branches of this association are scattered throughout various parts of the empire.

In the year 1869, the industrial code provided that all boys under eighteen years of age, might, at the discretion of the local authorities, be compelled to attend school. It is thus evident that the local or State authority was here consulted, rather than the General Government. At the present time however, when the adjustment of this matter is not in the hands of local authority, the employer, must, if those engaged with him desire so to do, allow such boys to attend school at their option. In some States however, Saxony, Bavaria, Hesse and Baden.

compulsory school laws are in force among all boys fourteen to eighteen years of age. At present the law of 1891 is active and the portion touching our problem is here given:

“Employers are required to give the necessary time, to be determined eventually by the competent authorities, to their workmen under eighteen years of age who attend an educational establishment recognized by the communal administration or by the State as an adult’s school. Instruction shall not be given on Sunday except where the hours are so fixed that the pupils are not prevented from attending the principal religious exercise or a religious exercise of their faith especially conducted for them with the consent of the ecclesiastical authorities. The central administration may, until October 1, 1894, accord exemptions from the last provision to adult schools already in existence, attendance upon which is not obligatory.

“For purposes of this law schools giving instruction in manual work and domestic duties to women shall be considered as adult schools.”

This citation points out that the Sunday class work must not conflict with the religious services. There is a strong sentiment in many places in favor of a repeal of such laws as prohibit Sunday classes at such times as church services are held. Many of the clergy are opposed to the extending of Sunday continuation schools, while for the most part the government authorities are favorable to such extension.

As regards the compulsory age limit, Prussia of all the German states is following out the option given the individual States. It is worthy of note that she declares (while declining to accept the law) that where freedom is allowed, boys are more likely to continue in school after their eighteenth year. It is insisted also that

with the restrictions removed, a deeper interest is excited in the school studies. The statement is made however that in Prussia two thirds of the industrial continuation schools have compulsory attendance laws in force as the local authorities may determine. Certain it is that much stress is laid upon the ethical side of instruction in the continuation schools and it is agreed that the compulsory school should not transplant the regular continuation school, except where it seems absolutely necessary to do so. In Bavaria for example, where the age limit by law is thirteen, the compulsory school has a place for the time being at least.

In Berlin, a century ago, Sunday afternoon classes were inaugurated, with a programme no more varied than that furnished by the three R's. Apprentices not equipped with sufficient school training were forced to attend the schools. In 1869 the power

was wrested from the trade guilds and the elective system resulted, later producing the Elementary Continuation School. The local city government founded at a later date three such schools, and in these a more diversified curriculum was operated, adding to the three R's, German composition and literature, modern languages, natural science, political science, law, book-keeping and drawing. For various reasons these schools were not attended by a full measure of success and the city authorities formulated the plan of placing the continuation schools in some of the higher institutions of learning, courses to be operative in winter only. Later, from the preparatory school, which fitted for the continuation school proper, grew up the technical continuation school.

There are at the present twelve schools of the continuation type in Berlin. A large attendance is desired, for with large classes

groups of various intellectual standards may be formed. The student is free to elect subjects—as between certain languages, mathematics or art studies. The Director of the school, by keeping in touch with the employers in the various trades and shops, can thus control the attendance and shape the course of the lines of work offered.

Some ten years since, two special lines of instruction were withdrawn from the continuation school proper — the carpenters' school and the Gewerbesaal, comprising work in drawing and theory involved in machine construction and the like. Courses for turners are offered in the carpenters' schools. In Berlin there are in excess of nine centers for the last named school and ten centers for the Gewerbesaal, the winter classes running up to 2000 and 850 pupils respectively.

This example serves to illustrate the fact mentioned in a previous connection, viz.,



that the *Forthildungsschule* was in some cases merged into a special school, for here, in reality a *Fach* or trade institution has developed from the original continuation school. This practice has been going on more or less extensively among the various schools; and in Berlin especially, the continuation school has been the foundation of most of the *Facheschulen*. Something more will be said in this connection in the section under trade schools.

Regarding the continuation schools for girls and women a word may be added. As with the boys' schools, so these designed for girls were put on foot, partly at least, from an ethical standpoint. Girls spending their days in the factory and shop were in need of a refining influence, and this the continuation school afforded. Courses were offered in the German language, arithmetic, sewing and dressmaking. The efforts made to give girls this training were not entirely

successful. So many objections to Sunday work were brought forward that it was discontinued. The burdens of the day fell so heavily upon the girls that they were not ambitious to attend evening classes. At the present time the schools are more largely attended by girls who, during the day, remain in the family, and in the school take up the household arts, sewing, cutting out, and the like, and also languages, mathematics, geography, etc., gymnastics and music, shorthand and typewriting. It is hoped soon to introduce cookery in all girls' schools. Drawing is given much attention.

There are in Berlin, nine municipal continuation schools for girls, which are, as the name indicates, maintained by the city.

## III

## TRADE SCHOOLS\*

As has been indicated in another connection, the classification of trade schools as such, is somewhat uncertain. It has been shown that many of the present schools for special trades have evolved from the continuation schools of the past. In the transition state it is sometimes quite difficult to definitely place a certain school, whether in the trade continuation, or trade group proper, or to class it with the Industrieschulen. The trade continuation schools have largely superseded the regular trade schools, in many localities at least, and where this condition exists, trade instruction seems to be losing ground, here the Fortbildungsschulen on the one hand, and regular ap-

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\*The two previous articles were published in the School Bulletin for July and August, 1906.

prenticeships on the other, coming in to supplant trade teaching.

The seeming contradictory statements made here must be interpreted in the spirit rather than in the letter, if the full meaning and significance of the trade school is to be grasped. Trades are taught as formerly. The point made is that while the trade school, *per se*, is doing its work, boys are, more and more, being trained for their trades in the so-called trades continuation schools and as apprentices in the shops. The latter form of training will be spoken of elsewhere in this section of the paper.

We have noted in following the work of the continuation school, that the attempt has been mainly toward the teaching of theoretical subjects, the practical lines being carried forward in the regular daily occupations of the individuals. Hence the trade is not held specifically in mind, although the desired end is always kept in view. In the

trade schools on the other hand, the work is largely of a practical nature, dealing with some particular occupation. The foregoing statement may be taken as fairly representing the Fachschule point of view, but it should be observed that while these schools are special trade schools, training for example iron workers, or joiners, or tailors, there is a differentiation within the general class. I refer to the Gewerbeschulen, where theoretical lessons are sometimes taught. These schools will be given mention in the secondary group.

Admission to the trade schools is gained usually at fourteen years of age, the length of each course covering a period of three years. The schools are in receipt of financial aid from both state and local governments.

To simplify our study, we shall consider only such institutions as deal with a single trade each, leaving the schools for the build-

ing trades and the like, and those dealing with industrial art and drawing to be treated elsewhere. Specialization has been carried so far that the following lists of schools, each training for its own particular trade or calling, may be given. The list is arranged alphabetically and without reference to the relative importance of the various vocations, or to the number of schools. Such schools are now found pretty generally in the larger cities throughout the Empire. Some of these are day schools; some evening schools, and others again offer both day and evening courses and Sunday instruction.

#### SINGLE TRADE SCHOOLS

##### Schools for Bakers

- “ “ Barbers and Hairdressers
- “ “ Basketmakers, Wickerworkers,  
and Strawplaiters
- “ “ Blacksmiths
- “ “ Bookbinders

- “ “ Carpenters and Cabinetmakers
- “ “ Chimney Sweeps
- “ “ Confectioners
- “ “ Coopers
- “ “ Gardeners
- “ “ Glaziers
- “ “ Joiners
- “ “ Marine Machinists
- “ “ Masons
- “ “ Painters
- “ “ Paperhangers and Decorators
- “ “ Plumbers
- “ “ Photographers
- “ “ Potters
- “ “ Printers
- “ “ Saddlers, Trimmers and Trunk-  
makers
- “ “ Shoemakers
- “ “ Tailors
- “ “ Tinsmiths
- “ “ Toymakers
- “ “ Upholsterers

- “ “ Wagonmakers and Wheelrights
- “ “ Watch and Clockmakers
- “ “ Woodcarvers

Some of the above named institutions are in certain localities styled apprenticeship schools. These train workmen and foremen of a minor degree. Shop work is offered, and in some cases pure and applied art as well.

The evening work of the so-called Artisans' Schools of Berlin, are deserving of special mention. There are two such institutions, called respectively school number one and school number two. The first was established in 1880; the second in 1892. The aim of these schools is to give to tradesmen and apprentices in their leisure hours such a knowledge of drawing, the arts and sciences, as will find an application in their own lines of work.

The grade of instruction varies from quite elementary work to that for advanced stu-



dents, the latter being obliged to present evidence of fitness before entering.

The following courses are offered, the figures indicating the number of hours per week devoted to each.

Arithmetic .....	2
Algebra .....	2
Geometry .....	2
Trigonometry .....	2
Analytical geometry and calculus .....	1
Mathematical problems involving physics and mechanics.....	2
Descriptive geometry .....	4
Bookkeeping .....	2
Physics.....	4
Mechanics .....	2
Electro-technics.....	4
Chemistry .....	4
Chemistry and pharmacy .....	4
Free hand drawing .....	2-4
Aquarelle.....	4
Projection .....	4

Ornament .....	4
Trade drawing according to occupation	4
Modeling in wax and clay .....	4
Decorative painting.....	4

In addition to the foregoing, school number two offers:

Chasing .....	4
Practical wrought-iron work .....	4
Sketching and calculating the elements of machinery.....	2

The courses continue for two years.

It is interesting to note that whereas certain enactments are in force regarding the Sunday sessions of the Fortbildungsschulen, there are no such restrictions placed upon the Fachschulen, Sunday morning classes being held at the discretion of the school authorities.

Let us refer to our table of single trade schools as given above. The statements which follow have in most cases been taken from data relating to the schools of Berlin,

and may be said to fairly represent the general existing conditions throughout the Empire.

In the school for bakers, instruction is given one day weekly for two and one half hours. The theoretical work (which in common with all such work in the regular trade schools, is related directly to the particular trade under discussion) is made up of chemistry and bookkeeping.

In the barbers' and hairdressers' schools, instruction is carried on six days each week, four hours daily, the school continuing six months of the year, covering the winter period. Each class receives fourteen hours instruction per week. While the bakers' school is supported by the guild, the barbers' school is jointly maintained by state, city and guild. The curriculum includes shaving, hair cutting, and hair dressing, wig making, and ladies' hair dressing. A tuition of three marks is charged for the

term, in the case of apprentices, and six marks for journeymen; a charge five times as great is made for ladies' hair dressing, and for the surgical lectures, ten marks.

The guild, state and municipality maintain the school for basketmakers and wickerworkers. Apprentices receive instruction free, four marks each semester being charged the journeymen and adults. Attendance is compulsory on the part of apprentices of guild members. Four hours work per week are given, on Saturdays. The annual expenses of the school, are about five hundred and fifty dollars. Four courses are offered, as follows: first, general basket making and wicker furniture; second, making of small wicker furniture; third, large wicker furniture; fourth, fine and artistic wicker working.

In the blacksmiths' school the instruction is for two hours, one day each week. Theoretical work in horseshoeing, and drawing

related to the course are taught.

The city and guild support the school for bookbinders. The students are both apprentices and journeymen. They work week day evenings and Sunday mornings. The purpose is not to produce tradesmen, but rather to make more proficient those engaged in some form of bookbinding, and to this end applicants must have had experience amounting to two years work before entering the school. All students must be grounded in the general elements underlying the trade before they are allowed to take up any phase as a specialty. No fee is charged the apprentices of guild members; others pay five marks per term; journeymen pay nine marks per term.

In the cabinetmakers' school, all lines of work pertaining to the trade are taken up, drawing and designing for trade purposes; free-hand drawing; modeling, carving; properties of woods, etc. Instruction is given

week day evenings and Sunday forenoons. Four marks are charged for the first term in the drawing course and for each subsequent term, two marks. The subjects taken up are: chemistry, free-hand drawing, projection, trade drawing, perspective and shadows, drawing from cast, modeling and wood carving, joinery. The school is under public control.

In most of the remaining trade schools, instruction is pretty generally given on week day evenings and Sunday mornings, the apprentices of guild members paying no fee, a small charge being made for outsiders. The support comes from city, state and guild in most cases. In the school for masons however, there is a preparatory course and also a carpenters' course, the whole covering a three years term. In this school the instruction is thorough, covering plans, drawings and specifications; stone, brick, and wood construction; foundations, arches,

staircases, roofs, and the like. Almost without exception in all these schools the winter attendance is greater than that in the summer.

Certain individual schools throughout the Empire deserve special mention, the Royal Fachschule of Iserlohn, the first in Prussia, being a notable example. Here handwork is combined with industrial art adapted to metal work. Boys who entered the trade were, in the early days of the school, found to be in need of both theoretical and practical work, so each has a place in the curriculum. The length of the course is three years, covering the trades of designers, wood carvers, moulders, founders, turners, chasers, engravers, gilders, and etchers. Here are taught drawing in all its branches; modeling in wax and clay; history of art and metal work; elements of chemistry and physics; mathematics; German. Practical work in the department in which the stu-

dent is engaged, is given, the student stating on entrance what subject he desires to take up. The time of instruction is from eight to twelve, in the winter season, and from seven to eleven in the summer. The afternoon session is from two to six. In the engineering trade school, three hours per day are devoted to ornamental drawing, German, physics and arithmetic. As the instruction is planned for working people it is largely theoretical.

The Reimscheid school is of the apprenticeship order. Attention is given the making of edge tools and such other implements as are manufactured in the district. All students take drawing and design as applied to iron work. They are made acquainted with the different kinds of iron work that can be carried on in the home; are schooled in the use of the tools made; learn regarding the markets at which they are sold, and the various methods of their



manufacture. Thus a general understanding of the principles underlying his trade is given the boy and he becomes acquainted with the commercial side of his calling while undergoing the necessary preparation in manipulation. The theoretical work is given in the morning and what shop practice is offered is in the afternoon from two to seven. The tuition is twenty dollars per year.

The Pottery Trade School at Hohn Grenzhausen, Prussia, is under State control. There are day and evening classes, the former attended for the most part by the sons of manufacturers; the evening classes by men and women who are employed otherwise during the day. There are Sunday classes also. Decorated stoneware is given much attention. The day class boys enter with a fairly good knowledge of drawing and have perhaps attended the Fortbildungsschule. Drawing, descriptive geom-

etry, modeling in clay and wax, new forms of vessels and original ornamentation, painting, designing and decorative art, manufacture of earthenware, lectures and study of collections, make up the curriculum. Any original model made becomes the property of the father of the boy, or of the person financially supporting such boy during his attendance at school. Two duplicates of the model must be left at the school. The courses are three years, daily sessions, Saturdays excepted. The fees are nominal, being only five dollars per year for the day classes, thirty hours weekly, and one dollar for evening work, two hours weekly. Pupils living outside the municipality pay six dollars per year for day instruction.

The Furtwangen, or Black Forest schools are made up of several divisions, giving rather a high class of instruction. Clock making, wood carving, and straw plaiting, are largely carried on.

This paper would not be complete without some mention of the system of apprenticeship in vogue in Germany. The Lehrwerkstätten or apprentice shops play a considerable part in the industrial life of the Empire. In some instances they are maintained in connection with the trade schools, or again, are semi-private or separate shops. The apprenticeship shops on the one hand, and the continuation schools upon the other, are doing much of the work formerly undertaken by the trade schools proper. While manufacturing upon a larger scale is recognized as possessing advantages over the smaller productive plants, it has seemed wise to hold to the handicrafts, in a measure at least. The apprentice system helps to preserve the traditions and sentiments of the German people, by handing down these handicrafts. The associations, vereins, and guilds of past time, are to-day, through the aid of legisla-

tion, coming to the fore, and bringing with them many boys trained in the shops under the masters. To show the power and scope of the guild, and in some cases it is incumbent upon a community to form a guild whether or no, let me give the following quotation:

“Persons carrying on trades on their own account can form guilds for the advancement of their common trade interests. The object of the guild shall be:

1. the cultivation of an esprit de corps and professional pride among the members of a trade;

2. the maintenance of amicable relations between employers and their employes, and the securing of work for unemployed journeymen and their shelter during the period of their nonemployment;

3. the detailed regulations of the conditions of apprenticeship and the care for the technical and moral education of apprentices;

4. the adjustment of disputes between guild members and their apprentices, as contemplated by the law of July 20, 1890, concerning industrial arbitration."

The shops offer about the same lines of work as do the private concerns, aiming however to be more systematic and to cover a wider scope. It is asserted by some that the instruction gained in the shop is superficial, and not to be compared with that obtained from the traveling master-workmen. When the shop is connected with some enterprise or manufacturing interest, a master-workman has one apprentice only under his charge, for which he receives from the state some thirty-five dollars yearly, the boy being given board, lodging and proper training. The master must have attained the age of twenty-four years, and must fulfil certain technical qualifications. The instruction is practical in the highest degree and thus follows the lead of the trade schools in letter

and spirit. The fees are mainly paid in by guild members, and those not members even, provided such reside in the district and are connected with the trade for which the school stands. Local and state aid is furnished. While the period of apprenticeship may extend over four years, three years is the usual term.

## IV

## ART TRADE SCHOOLS

The various types of institutions taken up under this head are of an intermediate grade, standing half way between the trade school on the one hand and the higher technical institutions upon the other. Indeed, they contain many elements in common with the lower group, their scope however being broader and more general or indirect, theoretical work finding a place in their curricula. Owing to a similarity in the instruction given, several classes of schools seem to demand a hearing under this section. We shall begin with the more general trade schools omitted from our previous study.

## SCHOOLS FOR THE BUILDING TRADES

## (Baugewerkschulen)

The schools for the building trades, of which there are a half hundred in the Em-

pire, are very similar in character throughout. The Munich school, established in 1823, was the first of its kind. Their aim, as indicated in the title, is the giving of training in the trades connected with the various building operations. The majority of these schools offer a course two years in length. The age of admission is fourteen to sixteen years. It is a requisite under some boards, that applicants have had practical experience in the line to be followed, at least two half-years and in some cases two full years, before entrance to the school. They must have also a fair general knowledge of their own language, and of reading and writing as well. The candidate must be a graduate of the Volksschule or must subject himself to an examination. The fees in these schools vary from fifty to two hundred marks per year. These are day sessions only. The governing power is in some cases vested in the municipality, fre-



quently in the State, and again in private enterprise.

While those who go out from these schools may, some of them at least, follow the trades as regular laborers, others again are qualified as master-workmen and leaders in their craft. Construction in wood, stone, iron and metals; laws of building; models of heat, light and ventilation; plumbing; interior fittings; these and other occupations are taken up. The sessions of most schools extend over the winter months only, the students being actively engaged in their several trades during the summer season. These schools holding continuous sessions, are sparsely attended during the summer. When theoretical work is given, such subjects are included as bookkeeping, descriptive geometry, physics and mechanics, German, free-hand and mechanical drawing, design, principles of architecture. The practical programme comprehends a study of building ma-

terials and the procuring and working of the same; relative strengths and adaptability to purpose; models of construction; ornamentation; architecture and design; estimates; chemical properties of materials; supports, trusses, arches and the like. In the more advanced institutions, algebra, surveying, mechanics, study of machines and chemistry may be added to the theoretical list given, while the practical studies are more intensive, and of a somewhat higher order. Special departments for engineering, (Tiefbauabteilungen) preparing men to occupy positions as superintendents, managers of public works, construction directors, etc., are sustained in some instances.

Such schools are of an inferior engineering type, and deal with problems of advanced work as related to the construction of roads, water works and railroads; municipal engineering; bridge construction; electro-tech-

nics. The theoretical lines are similar to those pursued in other courses.

The schools to which we have just referred illustrate well the statement made in a previous connection, that the grade of instruction rather than the character of the subjects taught, determines the classification of schools into groups. Three classes of trade instruction have just been mentioned, and might well be styled lower, middle and upper schools for trade teaching. Another point of interest lies in the fact, that while we have been speaking of theoretical and practical subjects as forming the curricula of the schools for the building trades, the distinction should rather be drawn on the line of traditional book subjects and applied or laboratory practice. Practical work, per se, is not carried on in the school. Thus we have a close connection between theory and practice; more closely perhaps than is found to exist in

other trades.

The following table shows the distribution of building trade schools throughout the Empire, the cities in which such schools are located being given.

Anhalt	Zerbst
Baden	Carlsruhe
	Kaiserslautern
	Munich
Bavaria	Nuremburg
	Ratisbon
	Würzburg
Brunswick	Holzminden
Hamburg	
Hesse	
Lübeck	
	Neustadt
Mecklenburg-	
Schwerin	
	Sternberg

Mecklenburg-	
Strelitz	Strelitz
Oldenburg	Varel
	Aix-la-Chappelle
	Berlin
	Breslau
	Buxtehede
	Cassel
	Cologne
	Deutsch-Krone
	Eckernförde
	Erfurt
	Frankfort-on-the-Oder
Prussia	Görlitz
	Hildesheim
	Höxter
	Idstein
	Kattowitz
	Königsberg
	Magdeberg
	Münster

	Nienburg
	Posen
	Stettin
Reuss-Schleitz	Gera
Saxe-Coburg-Gotha	Coburg
	Weimar
Saxe-Weimar-	
Eisenach	
	Stadt-Sulza
	Chemnitz
	Dresden
	Grossenhain
Saxony	Leipzig
	Orchatz
	Plauen
	Rosswein
	Zitteau
Schwarzburg-	
Sondershausen	Arnstadt

Wurttemberg

Stuttgart

## SCHOOLS FOR FOREMEN

(Werkmeisterschulen)

The Werkmeisterschulen or schools for foremen, are quite prominent in the scheme of secondary instruction. The courses given in these schools are of a general character, for the most part practical, and the institution, as the name implies, fits men to occupy positions as foremen and overseers. Machine construction is the chief industry for which these schools train. The first school of this character was opened in 1855 at Chemnitz, Saxony. There are at present twenty-one schools of this class in the empire. Sixteen is the regular age of admission. Candidates must have an elementary education on presenting themselves. Two years is the average length of course, including both winter and summer terms. A requisite for admission also is practical exper-

ience in the trade, hence little other than theoretical instruction is given.

To the objection made by some, to extending the course over two years of residence and of including the elementary branches in the curriculum (such opposition favoring a reduction in time given to preparation) the answer comes that the school should give a well grounded education, such as will fit the participant for all the functions of his social and industrial life. Fifty to sixty marks is charged yearly for tuition fees. Certain of these schools have both evening and Sunday classes, the tuition being twenty marks yearly for week day evenings, eight to nine forty-five, and Sundays, eight to ten in the forenoon.

Table showing location of schools for foremen:

Anhalt	Dessau
Baden	Mannheim
Bavaria	Four Mechanische Fach- schulen



Hamburg

Altona  
Cologne  
Dortmund  
Duisburg  
Elberfeld-Barmen

Prussia

Gleiwitz  
Gorlitz  
Hanover  
Magdeburg  
Inserlohn  
Reimscheid

Saxony

Chemnitz  
Mittweida  
Leipzig

The following data were compiled from tables appearing the Report of the Commissioner of Labor of the United States, for 1902. The hours per week allowed each subject taught in the schools of machinery construction, at Duisburg and Dortmund, Prussia, are given.

	DUISBURG				DORTMUND			
	FIRST YEAR		SECOND YEAR		FIRST YEAR		SECOND YEAR	
	First Half	Second Half	First Half	Second Half	First Half	Second Half	First Half	Second Half
German language and law.....	4	4	2	2	5	3	2	—
Arithmetic.....	4	1	—	—	5	2	—	—
Bookkeeping.....	—	—	—	—	—	—	—	3
Descriptive Geometry.....	—	3	—	—	—	—	—	—
Mathematics.....	8	6	4	2	—	6	5	2
Experimental Physics.....	—	—	—	—	7	2	—	—
Physics and Electricity.....	4	3	2	2	4	4	3	3
Experimental Chemistry.....	2	—	—	—	2	—	—	—
Penmanship.....	2	—	—	—	1	—	—	—
Drawing.....	12	—	—	—	17	—	—	—
Machine Drawing.....	—	6	8	8	—	10	8	14
Projection.....	—	—	—	—	—	2	—	—
Mechanics.....	—	4	4	4	—	5	5	2
Technology of mechanics, smel-	—	—	—	—	—	—	—	—
ing and refining.....	—	6	6	4	—	2	6	4
Theory of machines.....	—	—	—	—	—	6	—	—
Steam boilers and hoist machines	—	—	—	—	—	—	—	—
Steam engines and hydraulics and	—	—	—	—	—	—	—	—
small motors.....	—	—	—	—	—	—	—	—
Heating.....	—	3	—	6	—	—	—	8
Theory of building construction	—	—	4	—	—	—	—	—
Practice in the work shop for ma-	—	—	—	—	—	—	2	2
chinery construction....	—	—	—	—	—	—	4	4
Estimated wages.....	—	—	—	—	—	—	—	—
First aid to the injured.....	—	—	1	6	1	—	—	—
Total.....	36	36	37	36	42	42	42	42

The following table showing the occupations of one time students at three of the Prussian schools was compiled in April, 1898. This table may be found on page 883 of the Seventeenth Annual Report of the Commissioner of Labor of the United States.

OCCUPATION	Duisburg Graduates from Sept 29, 1883 to April 10, 1893	Dortmund Graduates from Sept 29, 1892 to April 10, 1896	Magdeburg Graduates from Sept 29, 1893 to April 10, 1896
Heads of establishments . . . . .	54	1	4
Other officers of establishments . . . . .	237	107	11
Machine builders and foremen . . . . .	39	18	1
Wage-workers . . . . .	34	9	
Owners of establishments or shops . . . . .	10	3	
Draftsmen and technical experts in offices . . . . .	86	55	83
Assistant Chemists . . . . .	3		
Students at other schools . . . . .	11	1	2
Other than technical work . . . . .	4	1	
Military service . . . . .	16	23	
Deceased . . . . .	11		
Unknown . . . . .	26	21	5
Total . . . . .	531	299	103

## SCHOOLS FOR THE TEXTILE TRADES

One of the most interesting groups of trade schools are those for the promotion of the textile industry in its various aspects, there existing at the present time no less than seventy-nine such institutions. The fourfold classification of these schools which follow, seems to be in accordance with the spirit of the work attempted.

First; the superior weaving school (Höhere Webschulen).

Second; the secondary weaving schools (Webschulen).

Third; the apprentice shops for weaving and knitting (Webereilehrwerkstätten).

Fourth; instruction by traveling or itinerant masters. (Wenderlehrer)

Not only does Germany rank high in the character of her textile schools, but instruction is exceedingly wide spread. Then again all lines of the industry are taken up,

from the most elementary to the most technical processes known. It will thus be seen that men are trained for the lower as well as for the higher branches of the art. In the highest classes of institutions weaving is almost exclusively carried on. The general Government assumes the control of these schools notwithstanding that in the beginning, many such institutions were put on foot through the initiative of associations and guilds. In each of the several classes the work is both theoretical and practical. The age of admission is usually fourteen years and the course of two years duration.

The Webschulen train, not for specialists as do the schools just mentioned, but rather aim to turn out foremen and bosses. The apprenticeship shops come more closely in touch with the workmen of small means and those using hand machinery, while the Wanderlehrer schools are moveable. In the

latter instance, the home becomes the school when the teacher is present; that is a competent instructor is employed to travel from place to place, visiting the small factories or home manufacturers, and giving such instruction as he deems wise and necessary. Much good work is still done in the rural homes of Germany, and through the means mentioned the standards are kept up.

The work of these textile schools is largely specialized, depending upon the the location of the school. In some localities wool, in others linen or cotton, or again in others silk will be given the chief attention. Both theory and practice have a place in the school instruction. Work in the various courses includes a study at first hand of the materials used, cost of production, relative values, various processes of manipulation, chemistry, drawing, designing, painting, lectures on fabrics, elements

of weaving and machinery used, and original design and practical work.

The distribution of textile schools is shown in the following table.

STATE	Superior Textile	Secondary Weaving	Primary Weaving	Weaving, Knitting and Trimming	Spinning, Weaving and Knitting	Spinning and Weaving	Primary Knitting
Alsace-Lorraine.....						1	
Bavaria .....		3					
Hesse .....		1					
Prussia.....	8	8	22				
Reuss-Greiz .....		1					
Reuss-Schleitz .....		1					
Saxe-Weimar-Eisenach....				27			1
Saxony .....					1		
Wurttemberg .....							

The Prussian superior textile schools are located as follows:

Aix-la-Chappelle

Bremen

Berlin

Grefeld

Cottbus

Mülheim-on-Rhine

München-Gladbach

Sorau

The Berlin textile schools may be taken as fairly representing the higher and more completely equipped institutions of this class. The age of admission is sixteen years, a secondary education being necessary to entrance. Several courses are offered as follows:

knitting, one year;

weaving, one and one-half years;

designing, two years;

passementerie making, one year;

dyeing, one year;

embroidery, one-fourth year.

There are day, evening and Sunday classes. The accompanying table shows the subjects taught in each course and the number of hours given to each subject,



reckoned on the basis of the entire length of course.

SUBJECTS	For manufacturers and superintendents, 1½ yrs	Designing, 2 yrs.	Knitting, 2 yrs.	Passementerie making, 1 yr.	Dyeing, 1 yr.
Theory of weaving.....	4	3	3	3	2
Design transfer.....	13		3	3	
Materials ... ..	1	½	1	1	
Machinery .....			3	3	2
Hand and power looms .....	3	2			
Motors, ... ..	1				
Preparing apparatus ...	1				
Finishing apparatus .....	1				
Practical exercises . . . . .	8	6	18	12	33
Dyeing .....	2		2	2	
Analysis and production of knitting goods .....			4		
Chemistry of fibers .....					2
Chemistry and physics .....					4
Drawing ... ..		23	2	5	
Arithmetic and bookkeeping .....	2		3	3	
Jurisprudence. . . . .	2		1	1	
Lecture . . . . .			2		

In many instances the weaving schools have in connection with them departments for dyeing and finishing. In such cases much attention is given to color blending

and harmony and to chemistry as well.

### GEWERBESCHULEN

Extended mention will not be made of the Gewerbeschulen, as the point of distinction between such schools and the Fachschulen was set forth under the last section. They partake of the character of trade schools, but are more general in their tendencies. While both theoretical and practical work are given, the former is not always applied theory, the Gewerbeschulen being based upon, what we in America speak of, as the educational side of trade instruction. These schools are attended by boys and men fourteen to twenty-four years of age,—individuals representing the various trades. The courses cover a period of three years. Both State and local moneys go to the support of these schools.

The Gewerbliche Fachschule of Cologne is somewhat distinctive. It instructs chiefly

the sons of tradesmen and superior artizans. There are three departments in the school:

First—that of engineering and architectural drawing.

Second—modeling department.

Third—the department of decoration, housepainting, etc.

The session covers both winter and summer months, the winter term, as in other cases, being the better attended. Other typical Gewerbeschulen are located at Grenzhausen and at Reimscheid. Applicants for admission must have prepared in the Volksschule or elementary school. The programme comprises the German language, French, English, literature, plane and descriptive geometry, physics, chemistry, drawing, mechanics, machine construction. The preparation here obtained fits the participants enter the higher schools, or to act as foremen and masters. These schools also lead up to the industrial schools of Bavaria, of which we shall now speak.

## INDUSTRIAL SCHOOLS OF BAVARIA

(Industrieschulen)

The industrial schools of the Bavarian Kingdom stand out as a distinct class of educational institutions. Here, since 1872, there has been a clean cut system, presided over by a Minister of Education. While the quality and character of the work done are quite similar to that taken up in the secondary schools elsewhere, the institutions are in some respects more exactly defined and supervision and instruction in the schools of weaving, woodcarving, basketmaking, pottery, violin making, etc., is frequently superior to that in some other locality.

The age of admission is sixteen years, two years being the usual length of course; the education of the Real-Schule is a requisite, or failing this, an examination must be taken. In 1901-1902 the Munich schools had an enrollment of 241 students, distrib-

uted as follows: mechanical engineering 124; chemical engineering 27; architecture 62; commercial 28. The graduates are fitted to occupy positions of trust and prominence in the various industrial pursuits of the country and to enter the technical colleges.

The Industrieschulen of Bavaria are four in number, located at

Augsburg

Kaiserslautern

Munich

Nuremberg

they having been established in 1868. Advanced courses are offered in mechanical engineering, chemical engineering, building construction, and commercial education. The school at Würzburg is of a somewhat superior order, although secondary in its tendencies, machinery construction and electro-technics being given attention.

In the mechanical engineering course the following subjects are studied:

elementary mathematics  
descriptive geometry  
calculus  
surveying  
physics  
German  
French  
English  
mechanics  
machine work  
machine construction  
mechanical drawing  
practical work.

In the chemistry course the curriculum  
is made up of

mathematics  
physics  
chemistry  
mineralogy  
German  
French  
English  
machine construction  
laboratory work.

The building construction course offers

language, mechanical drawing and architecture.

## HIGHER TECHNICAL SCHOOLS

### Technische Hochschulen

We have at this point in our study reached the schools of highest rank offering training of a technical character, called variously technical high schools, technical colleges, or polytechnics, the Technische Hochschulen. These schools are not high schools in the sense that the term would be applied to our American institutions, but are rather schools of collegiate grade, ranking in fact, as the title indicates in the university class. While not exactly comparable to our engineering schools, they approach more nearly these than they do any other of our American educational institutions.

Before the beginning of the century just closed it was apparent to some German minds more far seeing than the rest, that

schools of a higher than secondary rank must be inaugurated to offer training in the sciences; give opportunity to show the application of science to the arts; and prepare young men to grapple with scientific industrial problems such as were constantly springing up. Should the university attempt such work? An effort was made looking toward this end. It was at once evident that here was not the place to begin. The university was an institution in and of itself. Its methods, curriculum and aim were fixed, owing to long established customs. It had a certain work to perform, its own peculiar function to fulfill, and traditional and classical tendency were too strong to be checked in their movement, or to allow a branch stream to flow in and thus add to or modify the existing content.

The war for industrial supremacy, between England and Germany particularly, was a prominent factor leading up to the



establishment of technical schools in the latter country. Germany saw the necessity for heroic action, and her people, anxious to improve from the standpoint of her industries at home not only, but that they might rival and surpass their neighbors across the "Silver Streak" readily took up the cry for advanced scientific training. This then was the object of the Technische Hochschulen: (1)

"They were intended to secure for science a foothold in the workshop, to assist, with the light of reasoned theory the progress of arts and industry, till then fettered by many a prejudice and hindered through lack of knowledge; on the other hand, they sought to raise that part of the nation engaged in industry to such a love of culture as would secure to it its due measure of public respect."

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(1) Note on the earlier History of the Technical High. School in Germany by A. E. Twentymen in Special Reports on Educational Subjects, London, Vol 9, page 468.

The dates of the founding of the now existing Technische Hochschulen vary somewhat, certain of the schools growing out of a foundation which at the beginning was of a low or intermediate grade. Several of the schools have passed through a period of transition or reorganization state during the course of their existence. The institution, and time of establishment of each are as follows.

Berlin,	1799	Stuttgart,	1829
Carlsruhe,	1825	Brunswick,	1835
Munich,	1827	Darmstadt,	1868
Dresden,	1826	Aachen,	1870
		Hannover,	1879

In 1799 was instituted in Berlin the Bauakademie, a State institution whose purpose was set forth in the royal decree thus:

“To train in theoretical and practical knowledge capable surveyors, architects, civil engineers, and masons, principally for the Kings dominions, but foreigners may

find admittance if no disadvantage accrue thereby to the King's subjects."

Later, in 1821, Gewerbeschule came into existence, and in 1879 the union of these two formed the Berlin Technische Hochschule which is located in Charlottenburg, a suburb of the city. Owing to the high standards of this institution, it is styled the Koenigliche Technische Hochschule. Since its reorganization the plans of the other schools of like character have been modified in accordance with the Berlin scheme.

The preparation necessary for admission to the Hochschulen is equivalent to that demanded by the university proper. The age of admission probably never drops below seventeen, the average age being considerably greater. Men of mature years and of wide experience and training avail themselves to the privileges offered. The courses are from three to four years in length.

(2) "The new universities thus developed have the purpose of affording higher instruction for the technical positions in state and community service, as well as in industrial life, and of cultivating sciences and arts which are intimately connected with the field of technology (Berlin provisory statute, 1879). They prove themselves equal to universities in the following points: they claim for their matriculated students the same preparatory education required by the old universities, namely, nine years at a classical high school; they grant and insist upon perfect freedom in teaching and learning; and are under the direction of rectors elected for one year, instead of having principals chosen for life as in secondary schools."

It may be said here that an exception to the rule of the annual election of the administrative officers, is furnished in the exam-

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(2) Report of the United States Commissioner of Education, 1897-1898, page 70.

ple of the Munich school, which retains a permanent Director as the custom prevailed in times past.

Unless otherwise qualified, students must have prepared in the Industrieschule, the Gymnasium, the Real-Gymnasium or in the trade or building schools. In lieu of this an examination is demanded. Twenty-four is the minimum age of graduation.

In tracing the development of these schools from unpretentious beginnings to their present high standards of excellence, we see that more and more they have become unified in purpose and similar in curricula. In the early days too, the qualifications for admission, their dynamic government, and educational standards were lower and more diversified than we find them to-day. Sustained by the State and each administered by its board or council, they are doing a work which cannot be excelled by the universities themselves.

The organization of departments of work offered is approximately the same in all schools. In Berlin there are six departments:

- first, general school of applied science;
- second, general construction engineering;
- third, machine construction;
- fourth, naval engineering;
- fifth, chemistry and mining engineering;
- sixth, architecture.

Special attention is given certain subjects in one or another of these schools; civil or mechanical engineering, building construction, industrial chemistry, etc. An agricultural department is maintained at Munich, and a forestry department at Carlsruhe. That a knowledge of the application of electricity is considered essential in our modern methods is shown in the fact that all students in departments of machine construction engage in the study of electro-technics.

The courses of study are to-day upon more

of an elective basis than formerly although even now the results of the work of Nebenius are clearly seen. The success of the Hochschulen is due to the efforts of Nebenius more than to any other one man. His ideas were worked out at Karlsruhe and in greater or lesser degree incorporated into all the schools. It was insisted by him that a proper foundation must be laid before any successful special technical training can be had. Preliminary work must be mastered and a natural sequence of studies followed. To this end a fixed graduated course is recommended, the student to be promoted as ability may determine. For the one course-plan however have been substituted the several.<sup>1</sup>

The following table compiled from various sources will give some idea of the extent of

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<sup>1</sup> "Program der Königl. Technischen Hochschule zu Hannover, 1901-1902, page 90. Den Hörern bleibt die Wahl der Lehrfächer frei überlassen, Für ein geordnetes Studium empfiehlt sich aber die Beachtung der folgenden Studien und Stundenpläne "

Departments	No. of courses	SUBJECTS	No. of Professors and Instructors
General Science	58	Mechanics, Physics and general science studies; literature, French, English, Italian, law, political science.	33
Civil Engineering	34	Mechanics, railway construction, bridges, canals, harbors, hydraulics, drainage, land surveying.	13
Mechanical Engineering	54	Kinematics, machine construction, mechanical technology, machine design, water, steam and electrical machines, electro-technics, electro-mechanics, electrical and railway works.	23
Naval Engineering	19	Theory of ship building, classification of ships, designing of warships, boilers, machine construction, practical ship building.	6
Chemistry and Metallurgy	51	Organic and inorganic chemistry including physical, electro and technological chemistry, crystallography, metallurgy, foundry work, cements, botany, chemistry of plants and foods.	27
Architecture	65	History of art, architecture and ornament; building construction, designing of buildings in different materials and for various purposes, preparation of estimates, etc.	36



the work as carried on in Berlin. The school has a library of 54,000 volumes; a student body of upwards of 4,500 and a modern equipment throughout.

The rivalry existing among the various schools is in some respects a point to be commended. Then, too, the idea taking form in the Hochschulen and being more fully appreciated by the educationalists of our own country, that each school should specialize along some particular line, is worthy of attention. Energy is saved thereby, and students may have the advantage of increased facilities in equipment and instruction. Many Americans are studying in these schools, possibly more in Munich than elsewhere. While thorough in their treatment of subjects, the practical side of the work is too much lost sight of in the theoretical treatment. Testing and applied work are certainly given considerable attention however. To quote Dean Victor C.

Alderson of the Armour Institute, Chicago, who says in reference to testing:

"Professors regard this work as professional practice, just as doctors, who are professors in medical schools, have an outside practice. The technical school allows the professors free use of the laboratories, but assumes no responsibility for the accuracy of the results or opinions expressed."

The degree of Doctor of Engineering is conferred by these institutions, and that their work has been highly instrumental in developing the country can not be doubted, especially in the line of applied chemistry in which branch of engineering Germany leads the nations. How closely the development of the industries of Germany are related to the work of the Technische Hochschulen it is difficult to say, but that these schools have shown through the accomplishments of their graduates that high standards of moral and intellectual training can be had in other than the traditional universities, and that as efficient social

service can be rendered through the application of science to the arts and industries as by means of the languages, cannot be doubted.

## VI

SCHOOLS OF INDUSTRIAL ART OR ART  
TRADE SCHOOLS

The Kunstgewerbsechulen are schools of art. The causes leading to their inception are clearly set forth in a paragraph contained in the 1902 Report of the United States Commissioner of Labor. It reads:

“The international museums of 1851, 1855 and 1862, in England, Austria and Germany, respectively called attention to the fact that with all their technical excellence the industrial products of Germany possessed few qualities of artistic finish and design. France showed what could be done in this direction. Her products easily held first rank in this respect, her eminence being the result of centuries of training in this field. Since Colbert’s time industrial art education has been emphasized in the training of French workmen, and the accumulated skill and taste due to this training, has left

its impress on French products. The German states at once set about to remedy this weakness in this respect, and since that time have so persistently established museums and schools for industrial art training that now there is no important city in the Empire which does not possess one or more of these institutions”.

Considerable variety exists among the various types of art schools and even among those belonging in the same class and separated as to location we find differences. In Leipzig, Saxony, for example the Kunstgewerbeschule aims at the graphic arts mainly. In Berlin, Dresden, Karlsruhe, and certain other cities these schools train for sculptors and painters, and the term “Akademie” is frequently applied to these institutions. They are in fact, art trade schools whose main purpose, while yet industrial, is also the instilling of an artistic feeling into industrial work. They reach on and

out from the trade school and up to the institutions for the teaching of the fine arts. They are then a middle grade of applied art schools.

The genesis of the industrial art schools really lies in the establishment of museums of industrial art. The museums were an inspiring and energizing force, for here the best work could be exhibited and studied. The municipality and general government financed the movement for the museums. Schools sprang up in connection with the museums and later, independent art schools were established.

A moderate fee is charged those who pursue work here, twenty to forty marks yearly. Candidates must have had practical experience in the line of work they propose to take up, and both these schools and the so-called industrial drawing courses assume a certain proficiency on the part of the candidates; a proficiency in general subjects and in

drawing particularly. An examination is given those who cannot present the desired credentials. The length of the courses in these schools is usually three years. The classes are both day and evening, 8 A. M. to 4 P. M. and from 5 to 10 P. M. In some instances Sunday sessions are held also.

The courses consist of architectural designing in wood and metal, metal engraving and chasing, modeling, steel engraving and etching, design for fabrics, pattern designing, artistic embroidery, decorative painting, enamel painting, designing and painting figures and plants. The work throughout is both theoretical and practical in its nature, the instruction gained in the class being applied in the shop. The subjects of instruction and time devoted to each differ according to the course pursued. As an example of the programme offered, the following, taken from the architectural draftsman's course in the Munich school is given; the

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figures show the number of hours per week devoted to each subject.

First year,

linear drawing	7
ornament drawing	9
modelling of ornament and of the human figure	21
history of art	1
style	1
geometry and projections	3

Second year,

architectural drawing	7
drawing and modeling of the human figure and modeling of ornaments	20
history of art	1
style	1
perspective and shadows	2
anatomy, xylography, architecture, sculpture, or chasing	10

Third year,

architectural drawing	7
drawing and modeling of the human figure and modeling of ornaments	10



anatomy	1
xylography, architecture, sculpture or	
chasing	24

The Bauschule are only for those who wish proficiency in architectural studies.

What the Industrial Hall at Carlsruhe, the Industrial Art Museum at Berlin, and the National Museum at Munich are to the art schools proper, the open drawing halls are to the industrial drawing courses. Here, as in the museums, are kept models and designs of rare merit and students may pursue work under competent instruction. Such halls are established in Bavaria, Hesse, Prussia, Saxony and Wurttemberg.

In these art courses skill and originality are aimed at equally. The relation existing between the art work and the trade or industry with which it is connected is such as to make more valuable the latter.

It is needless to speak further of the museums. The art products there exhibited

give much incentive to students, as well as a feeling for the best from the standpoint of the beautiful and artistic, and all who visit them are consciously or unconsciously influenced for the better.

The following table shows the distribution of industrial art schools throughout the various States.

*Alcace-Lorraine*, Mülhausen, Strasburg.

*Anhalt*, Dessau.

*Baden*, Carlsruhe, Pforzheim.

*Bremen*,

*Bavaria*, Kaiserslautern, Munich, Nuremberg.

*Hamburg*,

*Hesse*, Mentz, Offenbach.

*Prussia*, Aix-la Chapelle, Barmen, Berlin, Breslau, Cassel, Cologne, Düsseldorf, Elberfeld, Frankfort-on the-Main, Hanau, Hanover, Iserlohn, Königsberg, Magdeburg.

*Saxony*, Dresden, Leipzig, Plauen.

*Wurttemberg*, Stuttgart.

## VII

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